Second part. K L 1857

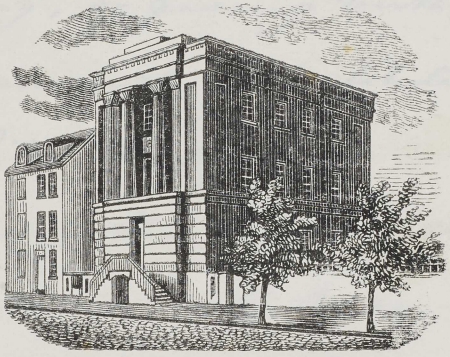
AN ESSAY ON

The Physiology of Reproduction,

and

History of the Corpus Luteum.

RESPECTFULLY SUBMITTED TO THE FACULTY OF THE



HOMŒOPATHIC MEDICAL COLLEGE

OF PENNSYLVANIA,

On the 28th day of January, Eighteen Hundred and Fifty-~~six~~ seven.

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The Physiology of Reproduction, and History of the Corpus Luteum.

Reproduction may be defined, as the act of a female being or animal, producing, or giving birth to another being or animal, constituted in all respects, like the parent.

In treating this subject, we shall confine our remarks to an exposition of the phenomena exhibited by the human female in the performance of the reproductive function.

In this department of Physiology, much may be said, yet little is known with positive accuracy. Writers on obstetrics advance many opinions, and conjectures, yet comparatively few facts can be substantiated. Though many

have instituted laborious investigations, still the function is enveloped in mystery, and it is unlikely that human art will ever penetrate it.

Thus we do know, however, that two dissimilar systems operate harmoniously, — the one — female, — germiferous; the other — male, — possessed of spermozoons, having vivifying qualities. The ability of these systems of genital organs, to perform, each its own proper function, is dependent upon many conditions.

Action of the Male.

Procreative power seldom exists until the age of fourteen to sixteen years. Though prior to this time, the testicles may secrete a fluid,

yet it lacks an essential part, and therefore has no life giving property, — no power to fecundate a germ. At puberty, however, when the male, not unlike the lower animals, receiving impressions through the senses of sight or touch, has connection with the female, the glans penis, in which are sensory nerves, is rendered acutely sensitive by friction against the rugous walls of the vagina, and an impression being conveyed to the Spinal cord, reflex contraction of the muscles of the Vesiculæ Seminales, and of the Prostate gland, is produced; whereby the contents of these receptacles, mixed with, and diluting the testicular secretion, sui generis, passing

into the Urethra, from thence are forcibly ejaculated.

Action of the Female.

We recognize the development of woman: we regard her as having arrived at a nubile age: that of puberty, by the performance of a seemingly necessary function- menstruation.

Menstruation is - Ovulation.

But we will define menstruation as a discharge of a sanguineous fluid from the Genitalia, occurring very regularly, once in 28 or 30 days; sometimes more frequently. This act is dependent upon the existence of an uterus, with its appendages, the ovaries, wherein are lodged Graafian vesicles, enclosing ova, - germs.

The period of life at which this phenomenon is first observed, is usually at the close of the fifteenth year. The age, however, varies, in accordance with climate, diet, manner of living, and social relations. — The first discharge is of a sero-sanguineous character. The second assumes more the appearance of blood; and when the function is fully established, the menses present a dark, red color, bearing more resemblance to arterial, than to venous blood. — Where does this blood come from? Writers differ in their views respecting the source of the menstrual discharge; some considering it as a secretion of the mucous membrane lining

the uterus; others as an uterine hemorrhage. Analyses of the menses go to show that it is not dissimilar in its character to blood proper. The solid constituents of healthy blood are 210; those of the menses 175. In the latter, blood corpuscles are found, and blood corpuscles are solids. Can solids be secreted? Fluids only are secreted. Therefore we may safely say that the menstrual discharge is an uterine hemorrhage, mingled with the mucus of the vagina. Appearing as an evidence of nubility, the 45th year usually brings with it the climacteric. The ability to bear children no longer exists. This uterine hemorrhage, or menstrual

flux continues from three to five days; and the amount of blood thus lost at each catamenial period, may be estimated at from four to six ounces. Many women, however, have a much more copious flow of blood than this, without apparent detriment. If there are no ovaries; if there is no uterus, there can be no menstrual flow, nor, consequently, can she reproduce. With the loss of the ovaries only, but an imperfect sexual sense remains, often none at all. But in the absence of the uterus, only, there may be sexual desire, but there can be no fecundation, — no conception. Many cases are recorded of women, who never had uteri,

and of necessity never menstruated. Though this is a species of Amenorrhœa, it should not be mistaken for the Suppressio; it is the Emansio mensium. Suppression of the menses can not be said to occur until after the full establishment of the function. Menstruation is Ovulation. The periodical hematic discharge from the uterine vessels, is accompanied by the evolution and expulsion of an ovum, containing its ovule. —

Before proceeding, in detail, to speak of the separate phenomena of reproduction, we must devote some space to the physiological consideration of certain organs, and their characteristics, all, particularly concerned in the due per-

formance of the function. —

The Ovaria. Attached at each angle of the fundus of the uterus, at the distance of an inch and a half, lying behind the Fallopian tubes, are two bodies, of the size of an almond, enclosed in a duplicature of the peritoneum. Formerly they were called testes muliebres; now known as ovaries, whose office it is to produce or prepare germs. Covered by a peritoneal coat, the inner, or tunica albuginea, encloses, as in a shut sac, a dense cellular tissue called stroma. In this stroma are inclosed numerous small vesicles or bullae, which, when freed from their attachment, appear globular, of the size of a pin's head. These spheroidal

bodies are filled with a pellucid fluid, which, from its being coagulable by heat, is believed to be principally albuminous. It is in fact, vitellary matter, like the vitellus or yelk of an egg. These globules, first discovered by De Graef, in 1672, are called Graafian vesicles, cells, follicles, or ova. In each ovary may be found 12 or 15 of these vesicles. Previous to the age of puberty, however, it is believed they do not exist; nor after the "critical period" of life.

Within these Graafian vesicles, or ovisacs, as Dr. Barry prefers to call them, are found numerous small granules; among which is an agglomerated mass, a cumulus of granules; and in the centre of this is the yelk ball, or ovum. Exterior of the ovum or yelk-

-ball, is a white, transparent circle, filled with oil globules, and vitellary corpuscles, called the Zona pellucida. Within the ovum, near its periphery, is a clear, transparent, oval vesicle, in which, high microscopic power reveals a dark spot. The oval vesicle is the germinal vesicle, sometimes called the Purkinjean; and the dark spot is the germinal spot. It should have been stated above, that a Graafian vesicle has two coats; an outer, and inner coat. The inner one is called the membrana granulosa: and the granules forming the cumulus, outside the Zona pellucida, are remains of the granular membrane. This membrana granulosa is thickest

in that part of the vesicle which is nearest the lining membrane of the ovary, — the tunica albuginea. Here a small elevation is formed, — an acervulus, which Baer calls the proligerous disk (Purkinje & Pappenheim) The germinal vesicle is $\frac{1}{60}$, and the germinal spot, the macula germinativa, $\frac{1}{300}$ of a line in diameter. — Upon this point late writers now agree: — that at every menstruation, a mature ovum is expelled from its ovisac, — the Graafian vesicle, and from the containing ovarium. Just before this rupture takes place, (the ovum now nearly matured,) the germinal spot moves towards the periphery of its vesicle; the germinal vesicle to that of the ovum; the ovum to that of the ovisac;

and the ovisac, to the circumfer-
ence of the ovary. Thus when all
the intervening walls are broken
down, the seminal fluid may meet
the germ, or ovulum; or, unstimulated
by the sexual act, the extruded
ovum falls into the peritoneal
cavity, or as is more common,
loses its vitality in a longer or
shorter time, and then is destroyed,
absorbed.

The Corpus Luteum.

Upon the supposition that ova were
never extruded except to be fecun-
dated, writers have asserted that
corpora lutea were the result of
impregnation, and subsequent
conception, alone. Now however it can
no longer be denied, that a corpus luteum,
at every catamenial period, is formed,

whether the extruded ovulum be fecundated or not. Every menstrual discharge proves the evolution and expulsion of an ovule; at what particular period, whether during, or at the termination of the flux, we do not know.

— For the sake of distinction, in which, though contrary to the belief of some writers, there is a difference, corpora lutea are spoken of as true and false; the former being those of pregnancy, and the latter of menstruation.

— Perhaps it may not be uninteresting to bring to mind the opinions of various eminent authors, concerning the corpora lutea.

William Hunter, and many Physiologists contemporaneous with him, disbelieving in the spontaneous evolution of ova, at

every catamenial period of the virgin
considered the formation of the corpus
luteum, as the accompaniment only
of pregnancy; and necessarily con-
nected with the act of impregnation.
— Velpeau regards the corpus luteum
as growing "after coitus." Dr. Gross
says that false corpora lutea
may be produced without coitus,
as a consequence of strong sexual
excitement"; yet thinks the true cor-
pus luteum a good evidence of preg-
nancy. Mr. Haighton (1791) says
that when corpora lutea are found,
"they furnish incontestable proof
that impregnation either does exist,
or has preceded." Haller (1803) asserts
the same. Montgomery (1837) says the
growth of a corpus luteum takes place
"on the occurrence of conception"

A host of authors, some even of recent date, have expressed their disbelief in the existence of corpora lutea in the virgin. Dr. Robert Knox thinks "there is no distinctive character by which the corpus luteum (of impregnation) may be distinguished from the miniature corpus luteum"; or that formed by menstruation. Dr. G. Wharton Jones declares "it would be rash and unwarrantable for any one to pronounce, from the occurrence of a corpus luteum, in the ovary, that coitus had taken place." Bischoff (1847) was the first to announce the following theory:- "That ova in mammalia, in the time of heat, no coitus taking place, are detached from the ovaries, enter the tube, and perish there; and that corpora lutea are found in the ovaries, just as though

coition and fecundation has taken place". Dr. Dewees adopts the opinion of Sir. E. Home, that the corpora lutea exist previous to impregnation; "and they have no less a destiny to perform, than to furnish the ovum, and prepare it for impregnation." M. Pouchet, admitting the existence of corpora lutea in the virgin, as well as in the matron, says there is no distinction between them, but that "they all have the same form, and the same structure." — Dr. John C Dalton, Jr., however, declares "that the corpus luteum of pregnancy is different from the corpus luteum of menstruation; and that it may, under ordinary circumstances, be readily recognized and distinguished from it". (Vid essay, 1851). Adopting, we will his opinion

endeavour to furnish the proof of his assertion. As a Medico-Legal question, it may sometimes be necessary to inquire,- What are the characteristics of a corpus luteum of pregnancy? and what those of menstruation?

1st. What is the character of a corpus luteum of menstruation?

Recent investigations compel all to believe, that upon the accession of the menstrual discharge,- at puberty, an ovum, within its ovisac, matured, protrudes from the surface of the ovary, bursts its walls, and becomes filled with blood. It not unfrequently happens that this takes place in both ovaries at the same time; or that two Graafian vesicles are expelled from the same ovary. The quantity of blood thus effused,

is variable. Why it should be so, we can not tell, any more than we can assign a reason for the great difference existing in the size of ovaries.

On the extrusion of an ovum from the ovisac, the proligerous disk (page 12) at its base, and a portion of the granular membrane are expelled with it. At the same time, there is a deposition of a "fleshy, yellow looking substance," upon the proper membrane of the vesicle. This is regarded as an hypertrophy of the vesicular membrane, which, near the cicatrix is very thin. Meanwhile, the membrane is folding upon itself, presenting numerous convolutions, such as are meet with in the brain, to make the bulk proportionate with the cavity. As these changes progress, the effused blood becomes paler, in

"proportion to the time elapsed," since the rupture of the vesicle. By the third week from the last menstruation, the yellow body has attained its full size. Externally, its situation is indicated by a tumor, as large as a pistol bullet, soft and yielding under pressure. A coagulum fills the tumor, the yellow walls of which are $\frac{1}{8}$ of an inch in thickness. The convoluted membrane, forming this wall, if spread out, would be much thinner. At this time, in the third week, the corpus luteum begins to retrograde, - to diminish in size. The coagulum, becoming still paler, is absorbed. From a sphere, the body is flattened. The retrogression continues till the sixth or eighth week from its first appearance. It then remains apparently stationary

tile the eighth month, when it disappears. This is the history of one. Meanwhile, many are in different stages of progression and retrogression, according to their various ages.

2nd Q. What are the characteristic appearances of a corpus luteum of pregnancy? — The description of a corpus luteum of menstruation, i.e. following the expulsion of an ovum, of course involves an act of fecundation. Yet the development of a corpus luteum attendant upon pregnancy, in its commencement, is the same as above. But if the discharged ovum is impregnated, here commences the distinction. In the latter case, instead of attaining its full size in three weeks, and then becoming atrophied, and finally

disappearing, the corpus luteum of pregnancy "continues to develope itself;" increases in size, nor commences to retrograde till after parturition. There is another distinction, — the process of vesicular protrusion ceases, for the time. Examinations of the corpus luteum of menstruation give evidence that its walls become much reduced in size, long before their yellow color fades away; that the coagulum retains its red appearance, even after the body is much diminished. In the case of a corpus luteum of pregnancy, these conditions are reversed. The yellow of the walls, and the red of the coagulum, seldom remain after the second month, while, meantime, the corpus luteum itself grows, — increases in size. At what period of

utero-gestation the yellow body is at its maximum, writers are not agreed. Dr. Carpenter states it as being between the third and sixth month. It is believed, that between these periods, the change, if any, is slight. - After parturition it rapidly diminishes, though it may be distinguished for many months. - In concluding this part of our essay, we will state the distinctions between corpora lutea of pregnancy, and those of menstruation, as given by Dr. Dalton, than whom, no one is more competent to decide. -

1st. It (i.e. the corpus luteum of pregnancy) arrives more slowly at its maximum of development, and afterwards remains for a long time as a very noticeable tumor, instead of under-

going a process of rapid atrophy.

2nd". It retains a globular, or only slightly flattened form, and gives to the touch a sense of considerable resistence and solidity.

3rd". Internally, it has an appearance of advanced organization, which is wanting in the corpus luteum of menstruation.

4th". Its convoluted wall, particularly, attains a greater development, this portion remaining sometimes so much as 3/16 to 1/4 of an inch in thickness, while in the corpus luteum of menstruation it never exceeds 1/8, and is almost always less than that. This difference in the thickness of the convoluted wall is one of the most important points of distinction. It will be much more striking when

viewed relatively to the size of the central corpuscle.

5th. The color is not, by any means, so decided a yellow, but a more dusky, and indefinite hue.

6th. If the period of pregnancy is at all advanced, it is not found, like like the corpus luteum of menstruation, in company with unruptured vesicles in active process of development. Vide Prize Essay. —

The Reproductive Function may be comprised under five distinct heads, as follows:-

1st. Fecundation, or Impregnation.

2nd. Conception, or "Fixation" of the Germ.

3rd. Utero-gestation, or Pregnancy.

4th. Parturition, or Accouchement.

5th. Lactation, or Alaitement.

Perhaps it would have been well

to peace Generation, or the formation
of the Germ, at the head of the list:
but as we have spoken at great length
in this connection, relative to the ova-
ry and its product, we will consider
1st. Fecundation or impregnation.
The terms fecundation and conception,
have been used by some authors,
synonymously. This cannot be.
Impelled by the mysterious ex-
citatic influence, the Fallopian
tube approaches its ovary, grasps it
with its posterious fimbriae, encloses
the ripened Graafian vesicle, frees
therefrom the mature ovulum, now
ready for the transit, which, entering
the tube, meets in its passage the
vitalizing sperm of the male;
becomes fecundated, - impregnated;
and then is conveyed to the uterine

cavity. This is Fecundation.
But Fecundation is not Conception. A fecundated ovule, unattached, may be lost in a sanguineous or mucous discharge, before conception can take place. But, remaining as it does, in a majority of cases, within the womb, it becomes attached, - it has conceived. This is the theory. Mr. Abernethy declared "we know nothing of the phenomena of fecundation."

2nd. Conception (con & capio)

Conception may be defined as the "fixation," (Meigs) the attachment of an impregnated, - a fecundated germ or ovule, within its proper receptacle. The body of the uterus.

A fecundated ovulum attaches

itself only to a mucous surface. If it therefore falls from the fimbriae, into the cavity of the pelvis, upon the peritoneum, - a serous membrane, it is lost. Its only proper place is within the uterus. Conception, however, may take place elsewhere than in the womb, as in the Fallopian tube; in the ovarium; or in the substance of the walls of the womb. These are cases of extra-uterine pregnancy. - While the ovum, after fecundation, is in the Fallopian tube, the uterus is making preparations for its reception. A lining membrane is thrown around the entire cavity, closing up the tubular openings and the os uteri. This membrane is in two layers, between which, in the first months of pregnancy,

a red colored fluid is found, called Hydroperione (ὑδωρ περι ωον.) This is finally absorbed, and the two layers are then fused together.
As the ovum enters the womb, this deciduous membrane is pushed before it, reflecting or reflexing upon itself. To this part is given the name decidua reflexa. The decidua vera is the outer fold or layer of the whole membrane. (Decidua, from decidere, to fall off)
The above is the Hunterian theory. M. Coste has proposed another, which Prof. Meigs partially adopts. (Vide Meigs) This deciduous membrane, then, is the outer covering of the embryo. The uterus also encloses it. — The Chorion (χοριον = the skin, from χωριζειν, to contain, to include. This is internal to the decid-

nous. Properly, it is the ovular membrane, formed while passing through the Fallopian tube, from plastic material, thrown out by the lining membrane; or perhaps from the Zona pellucida (page 11) composed of oil-globules and punctæ, which were extruded with the ovulum.

The Amnion, (ἀμνός, a sheep, because first observed in that animal.) enclosing the liquor amnii, is the inner membrane of all, and comes in direct contact with the embryo. It is supposed to be produced by a fold of an external layer of the membrana granulosa, (page 11) spoken of as lining a Graafian vesicle, and surrounding the Zona pellucida. It resembles the Chorion both in structure and appearance.

3rd ". Pregnancy, or Utero-gestation.

Pregnancy is the development of an embryo or fetus within the womb. How soon this process commences after the fecundation of an ovule, and its subsequent conception, it is impossible to decide. During the first three months of utero gestation, the term embryo, is applied to the germ; after that time, or when it has become distinct in its outlines, we call it fœtus. As pregnancy advances, there is an increase in the size of the womb, corresponding to the development of the embryo. In the virgin, the weight of the uterus is from 1 to ½ ounces; in length about 3 inches; and in breadth, 2 inches at the base, and 1 inch at the cervix. A wide departure from this standard attends the preg-

ren of gestation. At term, its gravid weight is from 1 lb. 1½ pounds; and instead of [illegible] being 3 inches in length it is 13 or 14. In this enormous growth of the uterus, its parietes do not become thinner; but in some instances are actually hypertrophied. The uterine arteries and veins elongate, attaining a greater proportional capacity. This is occasioned by the fact, that they are required to nourish not only the uterus itself, but to meet the urgent demands of the growing fetus. As gestation proceeds, the gravid uterus seeks more room. It rises from the pelvic into the abdominal cavity; often encroaching upon the intestines. The stomach now gives signs of sympathetic distress, evinced by nausea and vomiting. As physical signs of

It has been supposed that the presence of Kiesteine (from κυεῖν = to be pregnant, & ἔσθης = a garment or pellicle) in the urine, was an invariable diagnostic sign of pregnancy. - But Dr. E. G. Elcist Jr. of New York, in a recent paper, gives it as his belief, based on numerous observations, that this by no means can be relied on.

pregnancy, she have great protuberance of the abdomen; though this is by no means always caused by a gravid womb. The umbilicus protrudes. Meanwhile, the menstrual discharge has ceased. By the fifth month, any convincing evidence of pregnancy is adduced, by a change in the position of the uterus, supposed to be a movement of the foetus, and vulgarly termed quickening. As a medico-legal point, the foetus is now recognized as possessing life, - is entitled, and to destroy it is a felony. Now, though prior to this time, there may be no movement of the foetus, it is not because there is no vitality; but from want of strength: and the movement, if there be any, is so feeble, that the mother is not conscious of it.

The ordinary term, or duration of utero-gestation, usually ranges between 9 calendar or solar months, (270 days), and 10 lunar months, (280 days.) Instances are recorded, however, of pregnancies continuing much longer than this; even to the 12th or 14th month. (Meigs.) Again, the child has been born in less than the usual time. But 280 days may be stated as the usual term.

4th. Parturition or Accouchement.

Parturition, termed Tocology, (tokos birth, & logos) by Dr. Ryan, is a function, which consists in the expulsion of the contents of the gravid uterus. It is Labor; and may be natural, or unnatural. Happily a vast majority of cases belongs to the former condition. Different

writers on Obstetrics, divide parturition or Labor, into various stages, or periods. The following by Denman is considered the best arrangement.

There are three stages or periods.

1st ". Stage, Commencing with the accession of Labor pains, extends to the dilitation of the os uteri, and the consequent discharge of the liquor amnii.

2nd ". Stage, Commencing with the discharge of the "waters", continues until the birth of the child.

3rd ". Stage, Commencing with the delivery of the child, continues till the expulsion of the placenta, and membranes, — the secundines, or "after birth."

The first stage lasts from one, to

six hours. The second from one to three or four hours; and the third usually from fifteen to twenty minutes. Each of these periods is characterized by its own peculiar phenomena.

5th. Lactation, or Accitement. The mammary glands exist in both sexes, and are situated immediately over the great pectoral muscles; a layer of superficial fascia only intervening. In structure, this gland is like that of any others; composed of lobes and lobules, - acini, connected by a fibrous or fascial tissue. Each of these glandules gives out a tube, or lactiferous vessel, which, joining with others, form a communication to the

external surface. There are from fifteen to twenty of these ducts, or galactophorous tubes, in each gland. As they approach nearer the surface, they become larger, forming reservoirs, which, at parturition, hold in reserve a "draught," a milky secretion, to supply the immediate wants of the infant. Up to the age of puberty, the mammary gland of the female, is in no respect different from that of the male. At that time, however, or as the period approaches, the gland of the female rapidly enlarges; and the lactiferous ducts become capable of injection. External to the gland itself, the part increases in size; caused by a deposition of masses of adipose matter. At the age of

nineteen or twenty, the gland has attained its maximum of development; the mamma is fully formed, capable of performing that function, which necessarily devolves upon it at pregnancy. — In the centre of the breast, is a conoidal elevation. — The nipple. Around this extends a circle, which, in the virgin assumes a rosy tint; but as pregnancy advances, this circle, — the areola, becomes of a darker color, wider in its outlines, and is of a rugous character, containing a number of sebaceous follicles or glands. — In man, the mammary gland differs only in size from that of the woman. Instances are recorded of men,

In the mammary secretion previous to parturition, albumen is found to be the principal ingredient; with scarcely a trace of sugar. Gradually Casein takes the place of the Albumen, and at the same time, sugar and fat appear. After delivery, the secretion called Colostrum, (vid 40th page) is found. This is thicker than true milk, having a light yellow color, with no peculiar odor. It is alkaline in its reaction. The taste is very sweet. Analysis shows it to be much richer in butter and saccharum lactis, than ordinary milk.

whose glands and mammæ became largely developed, in consequence of permitting a child to suck the rudimentary nipple. This anomaly has been observed in some of the lower animals.

— The secretion of the mammary gland, — milk, is composed of water, holding in solution, sugar, salts, and an albuminous compound called caseine. This caseine contains oleine, which decomposes the proximate principles of milk, — butter, making it rancid. — Woman's milk contains more sugar and less caseine, than cow's milk; and in these respects resembles asse's milk. Saccharum Lactis is obtained by evaporating the whey of milk,

It is stated by French Physiologists, that during the period of suckling the infant, Glucose, a kind of sugar, is found in the urine of nursing women. Under these circumstances, there is no evidence of the existance of Diabetes Mellitus. This sugar exists in the proportion of 6 parts in the 1000.

and allowing the syrup thus formed, to crystallize. ($C^{24}.O^{24}.H^{24}$.)
At parturition, the first secretion of milk is known by the name of Colostrum (KOLOS = food.) This colostrum has a purgative effect upon the child, causing an evacuation of the meconium, (μηκος = poppy, an accumulation of fecal matter in the intestines.) At the expiration of twelve months, the colostric character of the mother's milk returns, and to nurse the child any longer, is highly injurious. Recourse must be had to other food. Dr. Rees states, that milk, in its composition, resembles blood, more than any other fluid.

TELOS. E.M.S.